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ABSTRACT

This paper addresses the lack of total honesty in communicating about technology in schools. A recent series of meetings in which state delegations focused on technology and discussed ways to collect and use information for decision making is described, in order to set the context for the paper. The discussion then focuses on the following assumptions about the use of technology for teaching and learning: (1) access equals use; (2) technology is actually used in schools in substantive ways; (3) teachers want to (or should) use computers to teach, but they have not learned how; (4) computers are used in ways that can improve students' scores on standardized tests; and (5) learning from (and about) technology occurs only in school. The conclusion stresses the importance of honest communication about technology in schools. An author biography is included. (MES)

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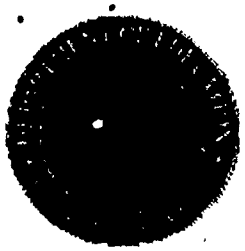

The Secretary's Conference on Educational Technology 2000

A Lesson from Richard Nixon: Observations about technology policy and practice in education

By
Saul Rockman

August, 2000

Where I'm starting . . .

Computers are a fact of life. Technology has become an increasingly important component of our lives, whether we planned on it or not. Microprocessors are in our refrigerators and in our cars; they entertain us and help us purchase the goods we need; they will create our medicines and deliver them to us. More than half of US households are on the Internet. Most families with children in school have a computer and practically all schools are connected to the Internet, even though inequities in both access and use abound both at home and in school.

Now, I am a user of technology—as are all likely to be reading this—and a researcher who studies the use and impact of technology in schools. I have a critic's scorn for unbridled enthusiasm as well as an advocate's defensiveness for unwarranted faultfinding. I am an affectionate cynic. I value what technology can help us accomplish, I want us to be sensible about how we use it, and I worry about the changes it is bringing to our lives.

Many of my friends and professional colleagues hold computers in businesses, in schools, and in homes to be an opportunity for changing the world beyond anything before in recorded history. It is fire; it is the wheel; it is movable type; it is the light bulb. But let us put it in perspective. It is one of many influences on our lives, one that will change us in ways we do not know, but one that is not changing all of us in the same way or at the same time.

Just how important is technology in school right now? I don't think it is as important as roofs that don't leak and functioning bathrooms that are clean and safe. I'd like all students to read—and the younger ones to be read to. I want children to come to school well-fed, healthy and happy, and enthusiastic about learning. I want them to have bright, well-prepared teachers who care about them and who have high expectations for the success of each child. There may be a few other things, but clearly, for me, there are important aspects of schooling that come before using computers.

Now don't get me wrong; I appreciate the value of technology for many things; I see its value for schooling (and learning). I use it and would have great difficulty giving up my computer. I find it sexy and sensual, powerful and empowering, both increasing my efficiency and filling my free time (sometimes wasting my free time). I want young people to have computers and to use them for important things and for pleasure. But we, as the adults, as the educators and technology leaders, must help form the beliefs and values that lead to appropriate technology access and use.

I'm certain I'm not alone in wanting these things for our schools and those who work in them (both students and adults). But many of us are struggling with issues about technology in school. Both advocates and critics

are prone to accepting a series of fallacies in our policies and our beliefs about technology and education. I want to add my perspective to the discussion, for you see, I have been conducting research on school reform and technology for quite a few years, and I have an idea of how technology gets used (or not) in schools of all kinds. I also have an idea of how policy helps or hinders effective applications of technology, and how our beliefs and expectations influence the public discussions of technology in education. I have information that can temper the enthusiasm of the advocate and that can counter the concerns of the nay-sayers.

The context for my concerns . . .

This past spring, I had the privilege of participating in a series of meetings in which state delegations focused on technology and discussed ways to collect and use information for decision making. Most delegations included state technology staff, a state curriculum person, and selected district and school site leaders, often a member of a state or local school board and a teacher or two. These groups began the process of developing strategies for aggregating (and disaggregating) information about technology's use and impact in schools, and of exploring ways to use technology to analyze and disseminate information about student achievement and teacher performance. My assignment was to observe and to comment about what I saw. And as that great commentator on the human condition, Yogi Berra, once noted, "sometimes you can observe a lot by watching."

Among the earliest things I noticed, varying in degree, of course, from state to state, was the long-standing lack of communication and lack of collaboration among the technology advocates at the state, district and school-site levels. District and school-site people were surprised to learn why certain state decisions were made, and state folk were amazed at how local goals differed from place to place—and from the goals set by the state. These regional meetings, involving practically all states, appeared to be the first opportunity for practitioners, policy makers, and policy implementers to sit at the same table and work together on common issues.

Many states use the leverage of matching technology funds to encourage certain applications of technology and discourage others. Today's environment of regularly-revised subject-matter standards and frequently-revised high-stakes testing often dictates the kinds of technology training that teachers receive, the curriculum that is used, and often the pedagogy that is applied in the classroom. But even in this environment of top-down mandates and strategies, it is troubling how little opportunity there is—regardless of interest—in bottom-up feedback, in tapping into local interests to help define policy and planning. Many state-level bureaucrats (used in the nicest sense of the word) did ask about what schools are doing in response to the state's initiatives; frequently states required formal reports on how technology funds were spent. But rarely, at this gathering of state and local leaders, did I hear about a state initiative that was based on the stated needs of the districts and schools.

There appeared to be a policy disconnect between those who fund technology and establish rules and regulations for its use, and those who actually work in the districts and schools and classrooms. While state needs assessments may inform policy makers about the desirability of telecommunications networks or additional computers, these state surveys rarely engage classroom concerns for professional development in new approaches to pedagogy or for software applications that would match learner deficiencies. Evidence of the one-way, top-down relationship surfaced during the sessions, often associated with how state administrators perceived political necessity and policy demands.

Among other issues I observed were the differences in perception among people with different professional roles. These became evident in breakout sessions where job-alike groups, rather than state delegations, met to talk about the use of technology and the needs of their constituencies.

In groups focused on students, groups that included many teachers, teacher-leaders, and teachers-turned-technology coordinators, the discussions focused on improving thinking skills, on authentic learning, on collaboration, and on constructivist issues. The participants were clear about the need to use the technology assets they had, and those they hope to gain, to help students become independent learners, good problem solvers, and active participants in the new economy. There was a strong, persistent, and common belief that technology existed in the schools to help students learn how to learn and how to creatively apply what they learn in real-world settings. When the talk turned to assessing what students learned, standardized tests were acknowledged and then quickly rejected because they were either not informative for the classroom

or because they were inappropriate measures of what the participants saw as the proper application of technology with students.

In other breakout meetings, attended by representatives of teacher training institutions, principals, district technology and curriculum coordinators, and staff development leaders, the discussions covered different issues, such as the preparation of new teachers to use technology effectively for instruction, professional development for the existing teaching staff, alignment of curriculum with state assessments and technology applications, and the desirability of building and district-level support for the use of computers with students. I don't recall a lot of deliberation about constructivism, about thinking skills and problem solving, or about independent learning (even on the part of classroom teachers). The participants talked about the problems they saw in setting standards for teachers' knowledge and application of technology in classrooms, in obtaining additional funding for pre-service and in-service education, and in developing a technology-friendly environment in schools and in district offices. Assessment strategies dealt with teacher performance, in demonstrations, portfolios, and reviews of lesson plans. Perhaps one or two participants mentioned student performance as an indicator of teacher performance, but more often educators reflected on the importance of not measuring teachers by the standardized test scores of their students.

At another breakout session, attended mainly by state-level administrators and policy-types, school board members and decision-makers, the discussions were different. At these sessions, the issues were about state assessment tests, resource inventories, and curriculum alignment with state tests. There was a clear focus on obtaining data that would provide supporting evidence for the state's expenditure of funds for technology. These participants were looking for ways to collect information that showed how technology made a difference in teaching and especially in learning. Sure, they were willing to look at case studies, at anecdotal evidence of school and student improvement, and even at technology skill development and attitudinal changes for teachers and students. But these were not seen as particularly useful or explanatory unless they were designed to expand on test score information. This group of participants wanted information that could be used to make state-level decisions, regardless of the burden this effort might pose on the districts, schools, teachers, or students. They were not concerned with test data that might help teachers better adjust their instruction to accommodate all students' needs effectively. Nor was there any well-stated belief that the tests were not appropriate measures of the impact of technology use or that technology use was not highly correlated to changes in student achievement. The state's money was spent on technology and the tests were the valued outcome measure at the state level.

To the observer—me—what was so interesting was the way that each group focused on its topic without concern for topics on which the other groups were meeting in adjacent rooms. Sure, they were directed by their facilitator to focus on their theme, but somehow their topic didn't intersect with other topics. There was a detachment that paralleled the disconnect between the various levels of operations, from the school to the district to the state. Were people not talking with one another? Or were they not listening? Or were people not saying what they knew to be either the truth or holding back on what the other party didn't want to hear?

Richard Nixon is purported to have stated in a meeting in 1970 that "Honesty may not be the best policy, but it is worth trying once in a while." I wonder if we are being honest with one another about technology and its use and impact in schools. Are we telling the truth about what we actually do with technology? Are we being honest with our colleagues, especially legislators and policy makers, who may have different agendas? Are we, the educators, able to fairly portray what we are using technology to accomplish in our classrooms? Are we, the educators, able to accept—or counter—what the politicians and policy makers *think* we are using technology to accomplish? And why do we continue to cling to our beliefs when we know that we will be judged on criteria that we do not control?

I'd like to talk honestly for a while, about what I believe is our lack of total honesty in communicating about technology in schools. I want to focus on a series of assumptions we have encouraged policy makers to believe, or passively let them accept about the use of technology for teaching and learning. We, the educators and technology enthusiasts, have not always told the truth, often, I believe, because we thought a little white lie would serve us better. Honesty may not always be the best policy, but shouldn't we try it once in a while?

Assumption 1: Access equals use.

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Just because technologies of various kinds are present in schools, does not mean that students actually can and do use them. Mere presence is not sufficient. We have wired practically all the schools (or at least pulled a wire into the school) and many of the classrooms, but there are not always computers and routers at the end of the wire. We have taken the horse to water (or brought the water to the horse), but without equipment, training, and purpose, there is little for which the schools can use these technologies. This is not to say that Universal Service and the e-rate haven't been valuable; they certainly have made the issues visible and public, they have enlisted politicians in the cause, and they have provided the opportunity to get more technology into the schools. It's just that they haven't created the outcomes we wanted—and *they* expected—to see. But these federal programs were not designed to do it all, regardless of what these policy makers believed.

We know that most schools, even the poorest, have access to the Internet; we also know that the poorest schools do not have the same access in their classrooms as the richer schools. (About half as many classrooms have Internet access in schools with the poorest students when compared to schools with the richest students.) We know that inner city schools have less access to both computers and the Internet, and that poor students average 16 children per computer in contrast to the 7-to-1 or better ratio in schools with wealthier kids. But access isn't important if no one uses the computers that are available.

There is a mistaken belief among many federal and state legislators, school board members and district administrators that, by providing access, the job is done. We have tried, with only modest success, to dissuade them from this conclusion, but we haven't succeeded. If schools have access to the Internet and there are computers in reasonable numbers, we also need to know that the teachers are prepared, that the technology is maintained and in working order, and that appropriate software is available. Further, we must also have a culture that encourages and supports the use of technology for teaching and learning.

Without well-prepared teachers, whatever technology is available will not be used or may not be used to reach appropriate outcomes. Computers aren't the answer for everything, nor are the options they provide an opportunity to be ignored. We need to have professional training and models for use, or teachers will continue to do what they have done in the past. Without well-maintained computers, teachers will lose interest and even begin to reject technology as part of the arsenal of teaching tools. We all believe that computers are "mission-critical" for businesses, and if a machine breaks down, it needs to be repaired immediately. Not so in education, and when teachers wait weeks or months for a repair to be done and redesign lessons as a result, they may not be encouraged to continue using technology in the classroom. And "Why bother" is not an unreasonable response.

[One could even make the argument that providing telecommunications access and truckloads of computers is not even the start of a solution for many urban and rural schools whose 70 or 80 year-old buildings do not have sufficient electrical outlets and power to safely permit the technology to be plugged in. Aging infrastructure is an impediment to universal access for many schools and keeps large numbers of students from using technology that students in neighboring schools can.]

The same is true for software and resources that facilitate teaching and learning. Without the tools to accomplish the tasks of schooling, the presence of working computers is not satisfactory. Teachers and students need the software that permits them to accomplish the tasks they have identified as important; they need reasonable access to the Internet, and they may also need other technologies, such as science probes, videos, and video production equipment. And most certainly, without the active support of the principal, and in turn the support of the district administrators, using technology in the classroom is not going to be a desirable or even a sanctioned classroom activity.

We need to start telling, or more forcefully persuading, those who legislate and fund and set policy that access is not a sufficient response, and that placing a wire and a few computers in each room will not ensure that students and teachers use the technology in productive ways. We need to thank them for the good start, but insist that their responsibility doesn't end with access. Schools need to be retrofitted for technology; we need to budget for repair staff and maintenance facilities, we need materials budgets that make it possible to acquire legal copies of software for students and teachers. And we need the legitimization that comes not from words, but from deeds.

Assumption 2: That technology is actually used in school in substantive ways.

I think we are all familiar with schools where computing is not widely available, where the technology is old and in disrepair. I think we know about schools where there might be one or two computers in a classroom that students can use when they complete their worksheets, and a lab where students get about one-to-two hours of computer access a week, on the average. We also know classrooms where students operate with little supervision and surf the Internet to explore the websites of their favorite sports team, the WWF, or Britney Spears.

I have a sense of what it is like at the other extreme, where computing is ubiquitous and all children have a laptop computer for home and school use. We have been studying students with above-average access to computers in school (and universal access at home) and comparison classrooms of students who had access all the time, with a laptop of their own. We shadowed them for days, noting what they did and when they did it; we asked others to keep logs of when and for how long they used computers. We found that seventh graders with full-time access used computers as much in a day as non-laptop students used them in a week. Tenth graders with laptops used computers in school more than two hours per day, over nine times as much as non-laptop students. Most importantly, this use of their computer was for the work they were accomplishing in school, not for games and chats and surfing entertainment sites on the Internet.

So what do we mean when we say that computers are used in schools? Does an hour or so of use each week mean that students have an opportunity to use technology for meaningful work? Or is it a modest intervention, that is more of a chance for them to master computer skills and write an essay now and then? Is fifteen minutes on a drill-and-practice program three times a week sufficient to make a difference in standardized test scores? And with little opportunity to use technology when they want to—as the needs arise or the desires materialize—just how useful is the computer to the students' academic life?

When students have access all the time, they have the choice of bringing their laptop out to take notes, collaborating on projects, writing their essays when the opportunities arise. We found that students with fulltime access to laptop computers used them for a variety of tasks and in all subject areas; they use them for writing and research, for taking notes and for organizing and analyzing data. They used computers in the same fashion that we, as adults, use them, as tools to accomplish their work, in this case, the work of school.

Given what we understand about what gets accomplished in schools where students have ubiquitous access, it becomes harder to say that students in classrooms with limited access have the opportunity to use computers in powerful ways. Yet, we have been telling administrators and policy makers that we are doing important things with technology, so important that they will influence student achievement in measurable ways. We need to provide them with information about what we actually do, admit our limitations, and argue not that we're accomplishing the important goals of education using technology, but rather that we're doing the best we can with the limited resources we have. We should be holding up professional models of access and use, rather than claiming to be second class citizens with only a limited need to have technology where we need it and when we need it. I don't think it's whining to ask for the tools to do the job we ask them to do.

Assumption 3: Teachers want to (or should) use computers to teach (but they haven't learned how).

Most teachers did not go into their profession because they wanted to manage student learning; they got in because they wanted to teach. They didn't plan on a career where they would oversee students working individually or in small groups using computers; they planned to teach. We've long acknowledged that teachers teach the way they have been taught, and since most have gone from 16 or 17 years of school right back to the classroom, in front of the room rather than in a seat, they know best only one way of teaching. The teacher stands in the front of the room dispensing information, and walks around, peering at student work, as children individually complete their worksheets or write their essays. If the computer doesn't fit into this plan, then using computers may not be teaching. So why should teachers want to use computers to teach, when *they* want to do the teaching?

Larry Cuban has been outspoken about the fact that teachers know how to use technology—to create lessons and instructional materials—but that they do not know how to use it to teach. Consequently, he says, teachers use computers at home to accomplish their work, but don't use computers in schools to teach. Teachers aren't technophobes, he states, just unfamiliar with ways to teach with computers.

Cuban's focus is on teachers, not on students; he says nothing about using technology for students to learn. Clearly, teachers can use computers to accomplish their work, but they may not let students use computers in school to accomplish the work they assign.

Cuban also complains that computers are being used for word processing and low-end applications and not the high-end multimedia applications he endorses, and his perception may accurately reflect what goes on in schools. What do kids do in school? Write essays and do work sheets. Could teachers do more and different? Yes. Could technology help? Certainly. That technology is being used to maintain existing instructional practice is the choice of teachers, not a constraint of the technology.

Changing pedagogy to use technology well requires a shift in the power balance of the classroom. It means focusing on learning, not teaching; it means providing opportunities, not information. It means teachers relinquishing control over students who have access to computers and the Internet. That is difficult in the teacher-centric world that Cuban sees—and I'm arguing that his model, not his perception of teachers and classrooms, is faulty. Learners can learn, even if teachers aren't doing traditional teaching.

It is an issue of power and control. We ask that all practicing teachers master technology and apply it in the classroom, and that all pre-service teachers learn it, too. Most professionals learn enough about computers to get their work done, but they don't need to learn more than that. For example, physicians may master a piece of extraordinarily complex software needed for the diagnosis of disease, but not know how to access the Internet. Teachers don't need to master all the software tools to get the best from their students, yet we insist they learn them. I'd rather teachers learn to say "yes" when students want to try out a new tool and then share what they learn with their peers. Too often we hear, "No, you can't use that because I don't know how to use it, yet." I think students, if given permission, could master and apply technology in amazing ways. When offered challenges and given powerful technology tools, our students can do marvelous things. But how do we get educators to give permission and get out of their way?

We need to free our children from the constraints that teachers impose when they don't know a technology. We need to give them permission to try—and occasionally to fail—rather than preventing them from gaining access to skills and ideas and information that will help them decide what work they want to do and how they want to do it. In our study of schools and classrooms where everyone had a laptop, we found dramatic and significant amounts of role switching. Teachers became students and students became teachers, all with the goal of developing new skills and acquiring knowledge. This is what we, as educators, like to see.

School administrators often perceive and talk about technology as a tool to support and extend teaching, or even to replace teaching staff. Teachers, justifiably, are disturbed that technology is thought of as something that can replace them or alter their role as teachers; they thought their part of the system was sacrosanct and protected. We need to convert this opportunity to inform administrators and policy makers that technology is not only a teaching tool, but, more importantly, a powerful learning tool that can change classroom culture. As such it requires different ways of thinking about the classroom and its organization, about pedagogy, and about control. These are highly emotional issues for all concerned, but such is the power of the technology to support changes in teaching and learning. Before we agree to make such changes, we need to consider the implications of these changes for how we assess and define success.

Assumption 4: Computers are used in ways that can improve students' scores on standardized tests.

Legislators and policy makers and parents are looking for simple answers to complex questions. "What is the impact of technology?" they ask. "Do test scores go up?"

We rarely stop to think whether the two questions are related. Are student test scores associated with the use of technology? Is the impact of technology use something that will show up on tests? Although these are not unreasonable questions, given the costs of funding education and technology programs, they may be the wrong questions. As norm-referenced, standardized tests are increasingly applied as the primary criterion for school success and improvement, we, as educators, continue to struggle with the implications of these high-stakes assessments. I don't want to rail against testing programs in this essay, but I do want to talk about the relationship between technology in schools and expectations about testing outcomes.

For the past six or seven decades (much of it well before my time), those of us involved with the application of technology in education have been faced with the question of its impact on test scores, probably because the more enthusiastic among us promoted the technology-of-the-day as a solution to most learning deficits and teacher problems. Every new or emerging technology would provide all students with the best teachers in the nation, the most motivating conditions for learning, access to all the world's information, increased learning rates, and put fun into mastering the skills needed for career success. The phonograph, radio, television, computers, multimedia, the Internet—all were offered as *the* solution.

Well, maybe we didn't tell the whole story. While we saw the promise, we didn't realize the difficulty and high costs of getting there; and we didn't see the need for partnering with teachers and administrators to assure adoption and success. We quickly learned that it wasn't education driving the development of the new technologies, it was business and entertainment. Everyone could see how each new technology was changing the society and could imagine how it could also change schooling. So why didn't test scores go up?

Sure, we can demonstrate test-score increases with the use of full-curriculum packages that use technology to deliver instruction and practice, such as those from CCC, or Compass Learning, or Lightspan. Packages, such as these, offer different roles to teachers—as diagnosticians, as managers and motivators of learning, but not as the provider of information. These new roles, in turn, require new skills, such as interpreting printouts of student progress and assigning appropriate new materials based on those outcomes. This may, for many teachers, take the pleasure out of being a professional, but, for many students, especially those significantly behind their grade-level peers, this use of technology often leads to short-term test score increases.

As exciting as this may be for building and district administrators, packaged curriculum isn't a solution for all. It certainly doesn't delight the technologists and educators engaged in constructivist approaches who see the opportunity of new ways of learning provided with computers and telecommunications. It is expensive and narrowly focused, they say, even if it does improve test scores for some students.

What is more common in schools around the country is a more loosely-structured application of technology: writing essays and reports, putting on class presentations of projects, using educational software that covers a particular concept or reinforces a skill. An hour or two a week of computer use in school seems a modest treatment. Why would we expect this limited effort to make a difference in norm-referenced measures of achievement? We know that parents' occupation and income are the primary contributors to test score differences, but we can't easily manipulate those variables. So legislators and policy makers look at technology as a costly intervention that should offer results, just like its advocates promised.

What we use computers to accomplish in schools are things that are not normally assessed on the norm-referenced, standardized tests used nationally and/or by individual states. We are doing more writing, more problem solving, more and deeper research, more engagement with the real world and with people outside of the classroom. What many children are learning—along with facts—are strategies for learning, thinking skills, and ways of working that will stand them in good stead in the work world they will be entering. These are things that are important to success beyond school, yet they aren't being tested.

Take writing, for instance. We do have evidence that writing will improve when it is taught using the computer. (The evidence also suggests that using the computer to write without teaching writing doesn't seem to improve writing scores.) However, we don't let our students use a computer to write on tests. Most state and nationally-normed tests include a writing sample that is assessed according to a rubric. Many students have spent more time writing on a computer, with its ease of editing, than writing with pencil-and-paper. Their skills and strategies have developed with the tools they use. In settings where schools have permitted writing samples to be prepared on computer, we are learning that their scores will improve when compared to students who write in a traditional fashion. Pencil-and-paper exams may seriously underestimate the writing abilities of millions of students, especially for students with good keyboarding skills. While we still don't know enough, it may also be that scores on other elements of standardized tests may also show improvements when students are allowed to take them on the computer. But without sufficient numbers of computers in schools, and improved security systems, we're not likely to know in the immediate future.

We have to begin telling a bit more of the truth to parents, school administrators, legislators, and policy makers. We need to say publicly and frequently, "We do not usually use technology to improve test scores." While we

could easily improve test scores by teaching test-taking skills using computers, I believe we would be better off to use technology to reach a little higher in the educational food chain, and work on the ways technology can extend our reach even further. We have to try a little honesty. Technology in school may best be used for the things that adults use technology to accomplish, their work. In the real world, we write, we organize and analyze information, we do research, we communicate with one another, all using technology. It is a tool for our activities. It is the activity, not the technology that will help students learn important skills and knowledge and, if tests are eventually designed to assess the important work we do, improve our test scores.

Assumption 5: Learning from (and about) technology occurs only in school.

We have reached the point where more than half of the homes in the US have a computer and access to the Internet. In homes where there are students in elementary and secondary school, more than 70% have access to the Internet. But home is not the only place where young people have access to computers and the Internet. In community technology centers, in Boys and Girls Clubs, in Y's and Girls Inc., in churches and afterschool care facilities, and in public libraries, students can find a computer and access to the Internet. Clearly there are inequities in access, mostly based on income and zip code, but these are dramatically changing as the cost of owning a computer diminishes and more local resources are established in neighborhoods where they are most needed. But the facts are evident: young people have substantial access to computers and the Internet outside of the school walls.

Thirty years ago, soon after *Sesame Street* first began broadcasting, young children started coming to school better prepared and with more knowledge than they had in the past. They knew the alphabet, numbers from 1-20, and many other things. Kindergarten teachers needed to change their curriculum to account for this new student entry level. It wasn't a panacea for all students, and the middle classes improved more than those with limited income, but the floor was raised.

We are beginning to find ourselves in the same situation today, with computers and the Internet. Students can undertake assignments at home, in the public library, or at an afterschool facility, and their reports can include information not found in their textbooks or lecture notes. They can identify experts to consult, capture and analyze data, work together with others in the same school or in other states. Yet, are our teachers and administrators willing to acknowledge this change in the out-of-school learning environment? Are they willing to accept the kinds of work-products coming from these students, and able to take advantage of the new learning opportunities at home and in the community? So far the answer is, "not especially."

I am constantly bumping into teachers who ask their students to develop and revise their essays using pencil-and-paper, and only enter them on the computer when they have been perfected. I am surprised to find those who ask their students to use only the library resources in their school to prepare reports. And I do find teachers who assume that anything coming in with an Internet reference, contains plagiarized material. I also know students who have their own websites but are still required to take a computer literacy class or told not to submit their reports as print from the computer. Large numbers of teachers and administrators are not sufficiently familiar with today's technology to know that, while they may not be part of the new age, their students are. They know what is being taught in school, not what is learned outside of it. We differentiate among students for class assignments, for reading assignments, for class selection, and for other instructional events, yet we set constraints for those who come to school knowing more than we do about technology.

What appears to be worse, at least to me, is the more difficult issue of how to take advantage of the technology and telecommunications opportunities available to our students. Generally, we don't know how to create assignments for students to do at home or at the library that could build or extend their technology skills or engage them in productive ways. These are risks that we should be willing to take, since students will be using the technology for chat rooms and games unless we present them with different challenges. We can encourage their enrollment in online courses, set them up with adult mentors in areas of strong interests, have them be tutors for younger children, or become penpals for seniors. We can build on school work or extend school through public service in the community by taking advantage of the interest, abilities, and access to computers and the Internet that students have outside of school. If we don't we're missing a great opportunity.

Is honesty the best policy?

After thinking about the assumptions we make, I'm of the belief that honest communication can prove beneficial.

Our country and our schools are in the process of flux. We find ourselves with a burgeoning school population, an enormous budget surplus, great concern about the preparation of new teachers, money being spent to improve the situation, rapidly changing but less and less expensive technologies, and assessment tests that seem to be revised every few years so that no real measures of change are possible. We can take advantage of this flux by speaking clearly about technology and education to policy makers and school administrators, and across the boundaries that differentiate among schools and districts and states.

We should be able to talk with legislators and policy makers about the status of technology in schools. We can thank them for helping education gain access to the Internet, but also remind them that access is not sufficient to reach our goals. We can reassert our need to have the tools to accomplish the job with which we are charged. We can tell them that what we use technology to accomplish may not be exactly what they think they are funding. And we can provide information about the important things we are using technology for in school administration and how the skills being developed by our students are those that our society needs and wants. We can help them see that the SCANs skills they identified eight years ago remain important components of education and also see that technology is a powerful vehicle for helping students develop the ability to collaborate, to solve problems creatively, to communicate effectively, and to apply the skills they are learning to the real world.

We can ask school administrators to create environments where technology can be used for learning, as well as for teaching, and where both learners and teachers have sufficient access to computers and telecommunications to do their work. We need to encourage the site-level leadership to help teachers accept the levels of student access outside of schools and take advantage of it. And we need building administrators to share how technology is used well: how technology can motivate those who are having a difficult time in school, how it can connect students and teachers to the real world and have them engage in meaningful problem solving, how it can improve communications skills, how it can offer more challenging work in the classroom, and how students become more responsible for their own work and their own learning. We need principals and district administrators to become a defensive line against the charge that improvements are measured only by test scores, and to mount an offense by portraying, to the press or influential community leaders, information about the important things that are being accomplished with technology, even if those things aren't improvements in test scores. (Sorry about that sports metaphor.)

We also need greater and more open communications within each state. Educators at the state level need to be brave enough to inform the legislature about how technology is being used in schools and what it is—and is not—accomplishing. We can point to changes in productivity in school administration, to more technologically-literate students who will be taking their place in our workforce, and to changes in teaching and learning that will eventually result in a more informed and capable citizenry. To accomplish this, we need more effective communication on the part of all educators. The states' education leaders need to become more aware of what teachers and students are actually doing and be responsive to their needs. Challenge the assumptions of the legislators and policy makers with evidence from the schools—not from test scores, where you're more likely to lose than win. Reflect, from the schools and the districts, on what opportunities exist for improved teaching and learning—in school and out—so that both the policies and the outcomes are more realistic.

But first, we the technology advocates in this nation's schools, must step up and offer a more realistic perspective on how we actually teach and learn using technology. And we can identify the resources and efforts needed to effectively accomplish our goals. We must stop offering a solution, when one doesn't exist; we have to recognize that technology alone won't create improved schools or improved learners. We have to continually remind ourselves and others that change doesn't happen immediately and that trivial uses of technology will not stand up to scrutiny. We must establish partnerships with those who can help accomplish our goals for learners, be they in elementary, secondary, or higher education.

As I said at the start, I am an affectionate cynic. I can see some of the mistakes and false arguments we have made. Yet, I want to see us succeed in our struggles to improve education and help students become the best life-long learners that they can. All technologies—the phonograph, radio, television, computers, the

Internet—hold out a promise for a better future, especially for our children. A little honesty in the right places can help us achieve it.

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experts

Saul Rockman

What does Saul Rockman say about how technology prepares students for the workplace? Click here.

Saul Rockman consults on education and technology for corporations, state and federal agencies, and educational organizations. He established Rockman et al in 1990 after leaving the education marketing group of Apple Computer where he was manager of education research.

While at Apple, Rockman disseminated research findings on the impact of computers for learning and managed a large-scale effects study. He helped Apple establish partnerships with educational organizations for national technology policy development. Prior to joining Apple, Rockman was director of technology programs at the Far West Regional Educational Laboratory (now WestEd) in San Francisco, California. There he conducted research on teacher training programs in technology, analyzed technology resources in social studies, developed distance education projects for rural schools, served as executive producer of award-winning videos on child care, and conducted technology policy research. Before moving to San Francisco, Rockman was director of research at the Agency for Instructional Technology in Bloomington, Indiana. At AIT, he conducted research on numerous instructional television programs for a consortium of state and provincial educational agencies and developed and managed a computer and video project on problem solving. He was noted for creating innovative evaluation techniques for television and computer materials.

Rockman writes and speaks on the impact of technology on learning, equity issues and technology policy, children s television, and evaluation methodology. He is the producer of award-winning children s television, and designer of award-winning multimedia projects, and has consulted for diverse

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organizations ranging from the Department of Education to The Disney Channel. He has written successful Challenge Grant proposals and is holds the evaluation contract for four Challenge Grant projects. Current and recent clients of Rockman et al include: Ameritech, Apple Computer, Autodesk, Br derbund, The Buddy Project, California Department of Education, Claris, Compaq Computer, Congressional Office of Technology Assessment, Children s Television Workshop, Indiana Department of Education, Microsoft, Pacific Bell, PBS, TRO, US West, WarnerActive, and several NSF and Department of Education projects.

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